6. FLAT BED IMAGE SCANNING SECTION

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6. Flat Bed Image Scanning Section

[Theory of Operation]

1. Scanner Table Setting System

- Basic

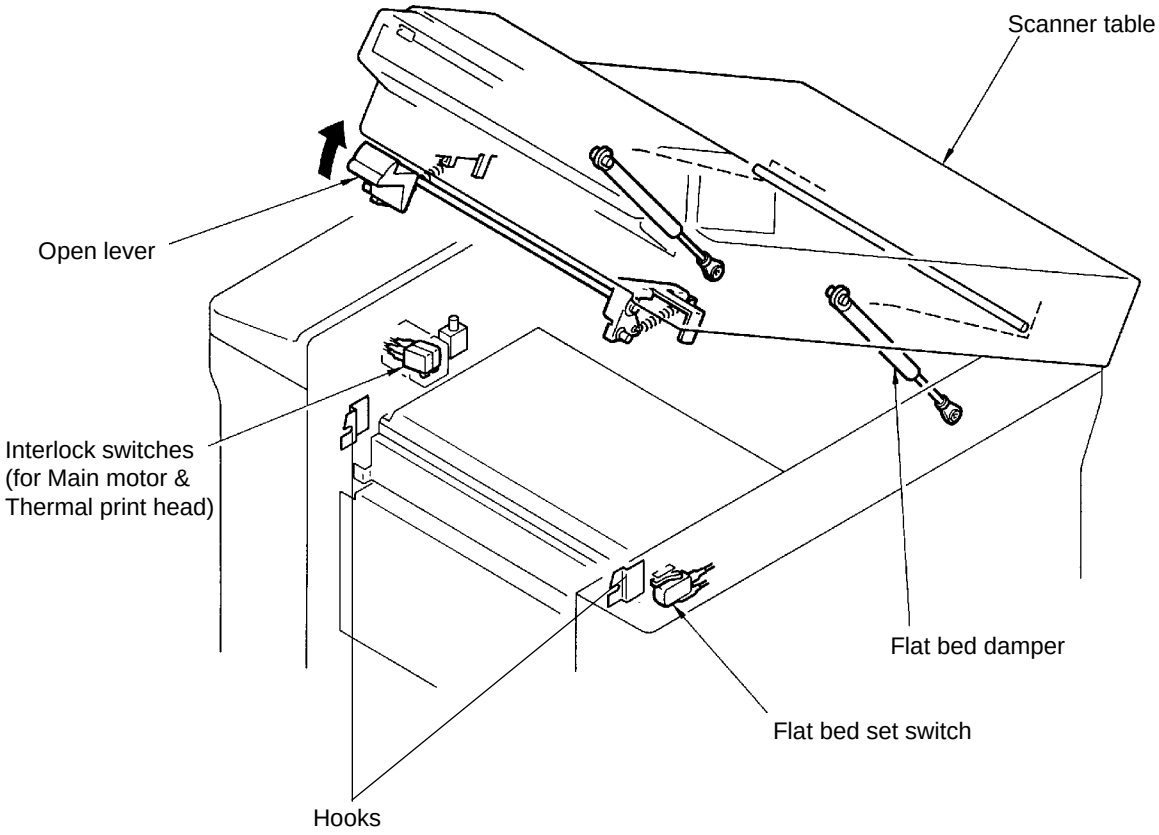
The Scanner table is pushed up by two Flat bed dampers when released from the hooks of the machine by holding the Open lever.

- Function of Flat Bed Set Switch

The Flat bed set switch detects whether the Scanner table is open or closed.
When the Flat bed set switch is released OFF, the error code **[E 56]** is displayed on the operation panel.

- Function of Interlock Switches

When the Scanner table is opened, the Interlock switches are released OFF, interrupting the power to the Main motor and Thermal print head.



2. Flat Bed Original Detection System

- Basic

When an original is placed on the Stage glass, the machine status is changed from "printing" to "master making".

- Function of Stage Cover Sensor

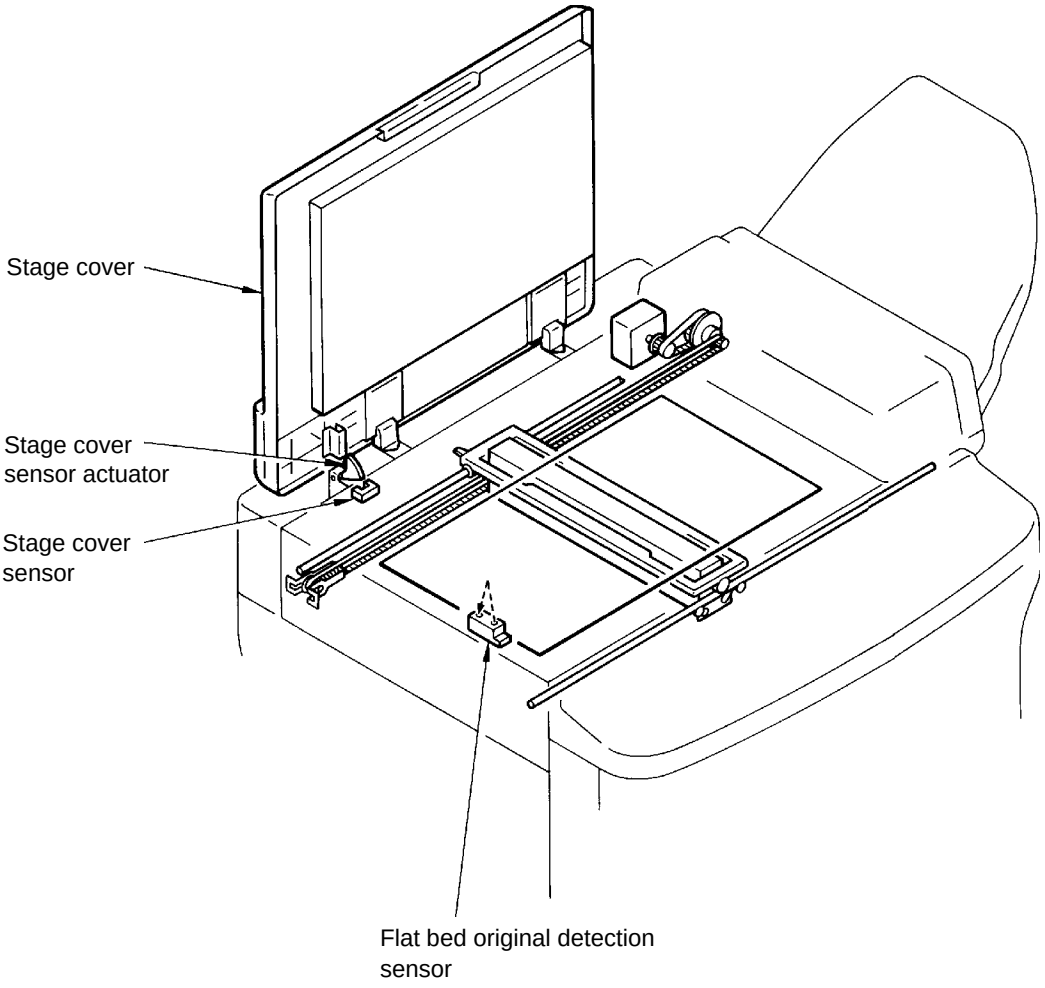
The Stage cover sensor checks whether the Stage cover is open or closed by checking its light path.

The light path of the sensor is blocked by the Stage cover sensor actuator when the Stage cover is closed more than halfway down.

- Function of Flat Bed Original Detection Sensor

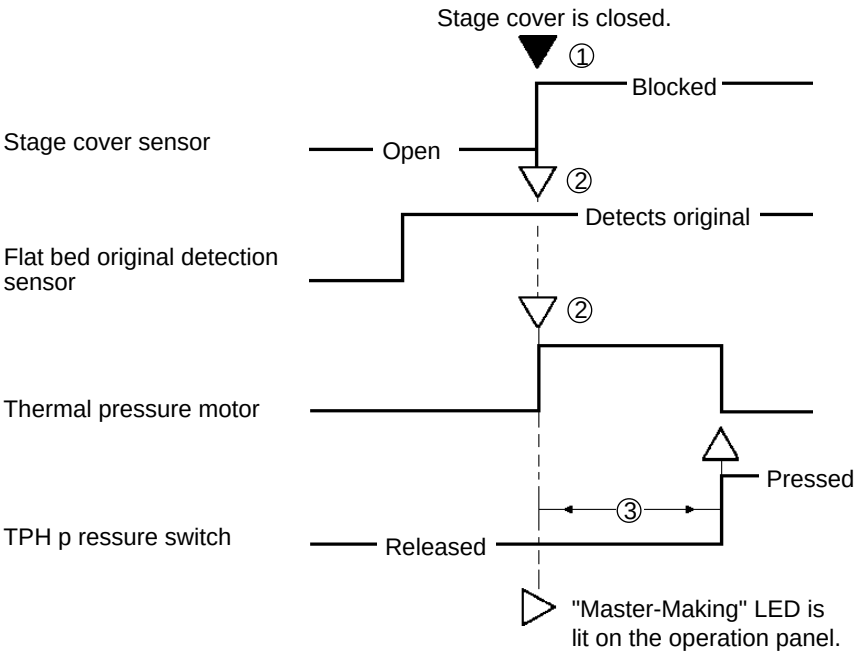
When the light path of the Stage cover sensor is blocked, the Flat bed original detection sensor checks for the presence of an original on the Stage glass.

When the sensor detects an original on the Stage glass, the "Master-Making/Print" LED on the operation panel is changed from "Print" to "Master-Making" and the Thermal pressure motor is activated to lower the Thermal print head until the TPH pressure switch is pressed.



- Timing Chart -

Flat Bed Original Detection System



① FB-ADF Original detection sensor is not pressed. (Refer to the page VI-12.)
Both the ADF switch and Flat bed set switch are pressed.
② When the Flat bed original detection sensor detects an original, the Thermal presssure motor is activated to lower the Thermal print head until the TPH pressure switch is pressed.
③ If the TPH pressure switch is not pressed **within 4 seconds** after the TPH pressure motor is activated, it is assumed that the Thermal presssure motor has been locked and the error code **[E 19]** is displayed.

3. Image Scanner Initial Movement System

- Conditions for Image Scanner Initial Movements

The Image scanner makes either of the two initial movements mentioned below in the following cases:

Initial Movement 1

1) The power is turned ON or "ALL RESET" button is pressed without originals on the ADF tray and with the Book processing feature set inactive as the initial setting by the User mode.
2) The Book processing feature is cancelled.

Initial Movement 2

1) The power is turned ON or "ALL RESET" button is pressed with originals on the ADF tray or with the Book processing feature set active as the initial setting by the User mode.
2) The ADF original detection sensor is actuated ON by placing originals on the ADF tray.
3) The Book processing feature is selected.

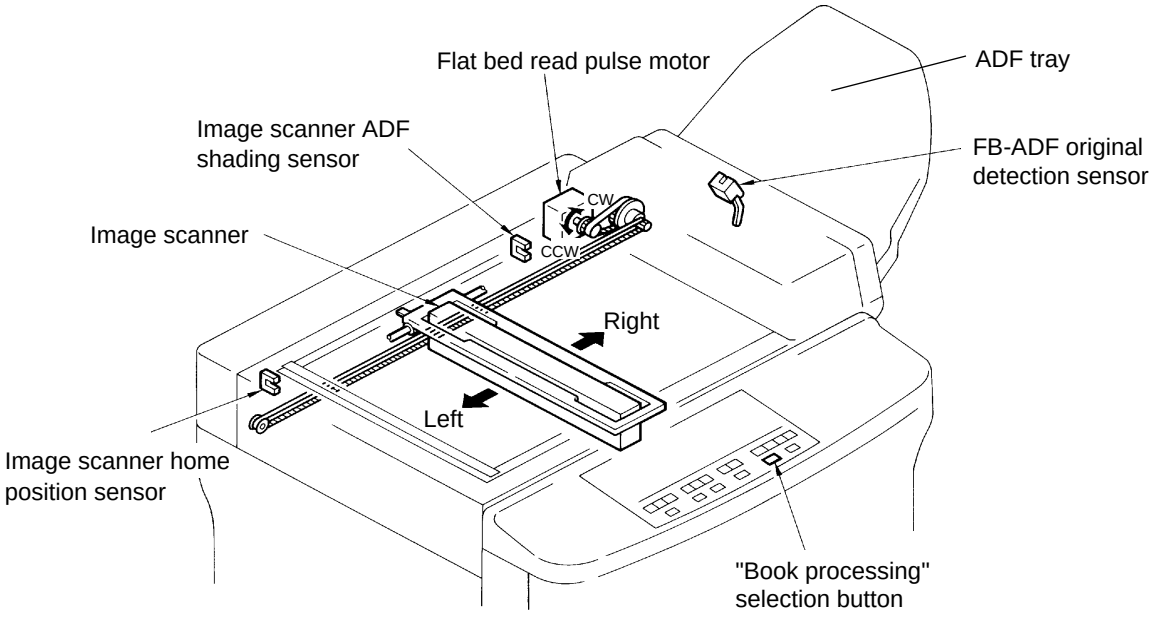
- Image Scanner Initial Movement 1

(i) If the Image scanner home position sensor is not detecting the bracket of the Image scanner, the Flat bed read pulse motor is activated to transfer the Image scanner to the left until the sensor detects the bracket.
(ii) If the sensor is detecting the bracket, the Image scanner stays still.

- Image Scanner Initial Movement 2

(i) If the Image scanner ADF shading sensor and Image scanner home position sensor are not detecting the bracket of the Image scanner, the Flat bed read pulse motor is activated to transfer the Image scanner to the left.
- If the Image scanner ADF shading sensor detects the bracket of the Image scanner **within 2204 pulses** after the Flat bed read pulse motor is activated, it is assumed that the Image scanner is located under the ADF unit and the Flat bed read pulse motor is stopped.
- If not, it is assumed that the Image scanner is located outside the ADF unit and the Flat bed read pulse motor starts to reverse after **10msec.** rest, to move the Image scanner to the right until the Image scanner ADF shading sensor detects the bracket of the Image scanner.

(ii) If the Image scanner home position sensor is detecting the bracket of the Image scanner, the Flat bed read pulse motor is activated to transfer the Image scanner to the right until the ADF shading sensor detects the bracket.
(iii) If the ADF shading sensor is detecting the bracket, the Image scanner stays still.



- Timing Chart -

Image Scanner Initial Movement (1)

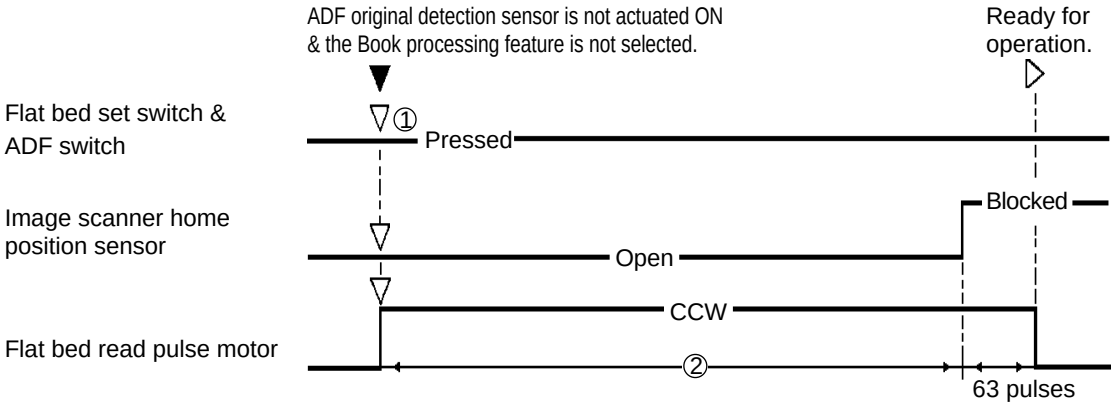
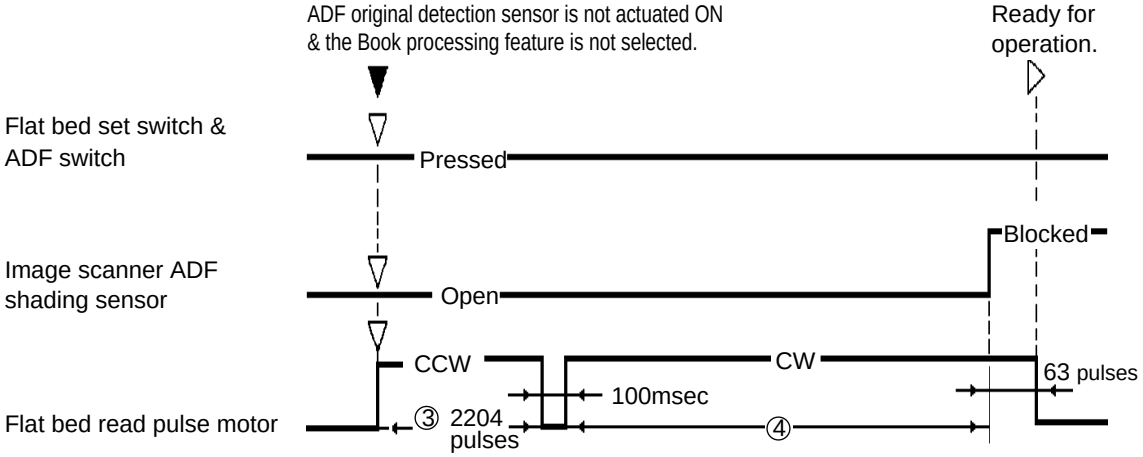


Image Scanner Initial Movement (2)



① If the Flat bed set switch is not pressed, the error code **[E 56]** is displayed.
If the ADF switch is not pressed, the error code **[E 59]** is displayed.

② If the Image scanner home position sensor does not detect the bracket of the Image scanner **within 18898 pulses** after the Flat bed read pulse motor is activated (CCW), it is assumed that the Flat bed read pulse motor has been locked and the error code **[E 15]** is displayed.

③ If the Image scanner ADF shading sensor has detected the bracket of the Image scanner **within 2204 pulses** after the Flat bed read pulse motor is activated (CCW), the Flat bed read pulse motor is stopped after making an additional **63-pulses** (CCW).
If the Image scanner home position sensor has detected the bracket of the Image scanner **within 2204 pulses** after the Flat bed read pulse motor is activated (CCW), the Flat bed read pulse motor rests for **100msec.** , then reverses rotation (CW).

④ If the Image scanner ADF shading sensor has not detected the Image scanner **within 15748 pulses** after the Flat bed read pulse motor reverses rotation (CW), it is assumed that the Flat bed read pulse motor has been locked and the error code **[E 15**] is displayed.

4. Image Scanning System - Without Book Processing Feature & ADF

- Basic

The Image scanner is located at the Image scanner home position sensor and scanning starts after the shading compensation is made.

- Start of Image Scanning

By placing an original on the Stage glass and pressing the START button, the LEDs of the Image scanner are turned ON and the shading compensation is made.

200msec later, the Flat bed read pluse motor is activated to move the Image scanner to the right.

472 pulses after the Image scanner goes off the Image scanner home position sensor, the Read & Write start signal is turned ON and the image scanning starts.

At the same time, the Master making and Master removal processes take place.

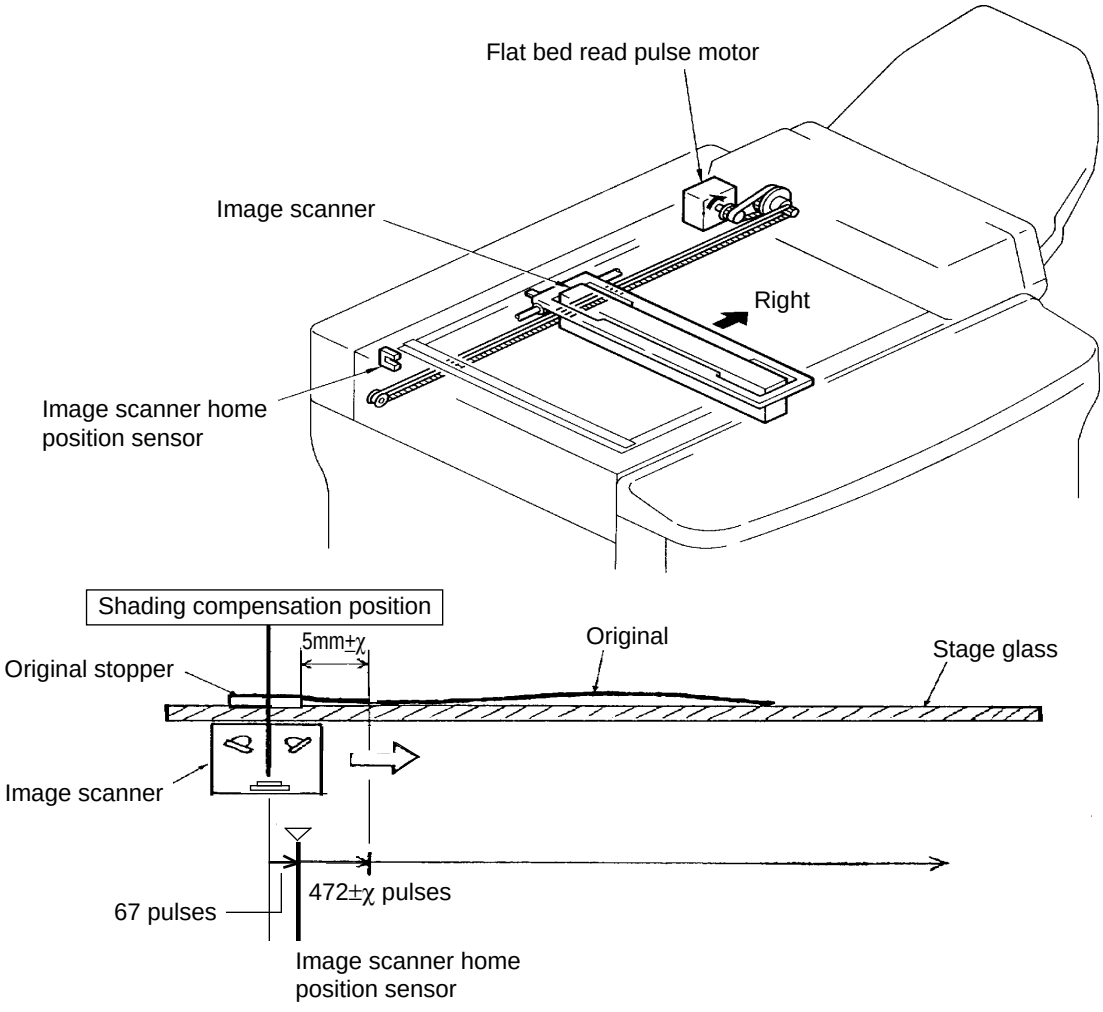
- End of Image Scanning

When a master is made for the size of the paper on the Paper feed tray, the Read & Write start signal and the Flat bed read pulse motor are turned OFF to end the image scanning process.

When the Read & Write start signal is turned OFF, the master making process is also finished and a new-made master starts to be loaded on the Drum after confirming that a used master has been removed completely.

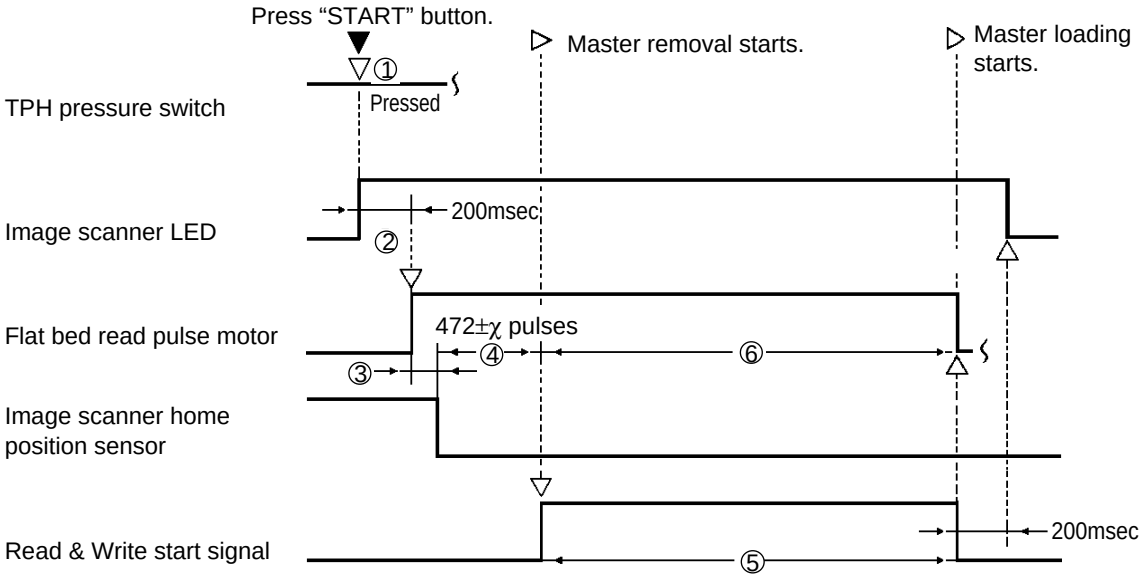
- Return to Home of Image Scanner

200msec after the Read & Write start signal is turned OFF, the LEDs of the Image scanner are turned OFF and the Flat bed read pulse motor starts to reverse rotation to return the Image scanner to the home position (at the Image scanner home position sensor).



- Timing Chart -

Image Scanning System - Without Book Processing Feature & ADF



① If the TPH pressure switch is not pressed, the Thermal pressure motor is rotated until the switch is pressed.
The image scanning starts only after the TPH pressure switch is pressed.
② The shading compensation is made automatically when the LEDs of the Image scanner are turned ON.
③ If the Image scanner has not gone off the Image scanner home position sensor **within 314 pulses** after the Flat bed read pulse motor is activated, i.e. the light path of the sensor has not been opened, it is assumed that the Flat bed read pulse motor has been locked and the error code **[E 15]** is displayed on the operation panel.
④ The "χ" pulse can be increased or decreased by Memory switch **No.87**.
⑤ The Read & Write Start Signal is turned OFF when a master is made for the size of the paper on the Paper feed tray.
⑥ If Read & Write Start Signal has not been turned OFF **within 13701 pulses** after it is turned ON, the signal and the LEDs of the Image scanner are turned OFF compulsively.

5. Pre-Scanning System - With Book Processing Feature & Without ADF

- Basic

The Image scanner is located at the Image scanner ADF shading sensor and pre-scanning starts after the shading compensation is made.

- Start of Pre-Scanning (Check of Original Size)

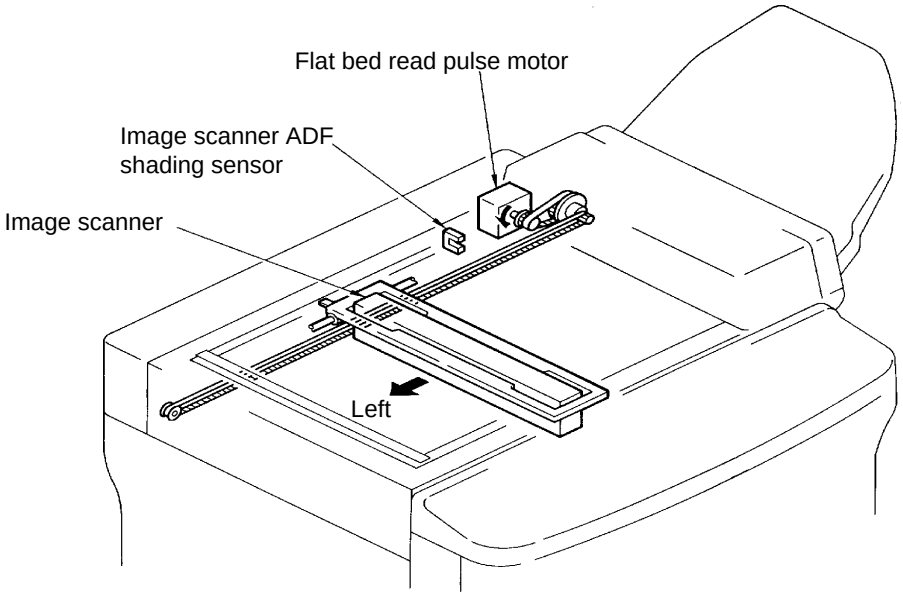
By placing an original on the Stage glass and pressing the START button, the LEDs of the Image scanner are turned ON and the shading compensation is made.

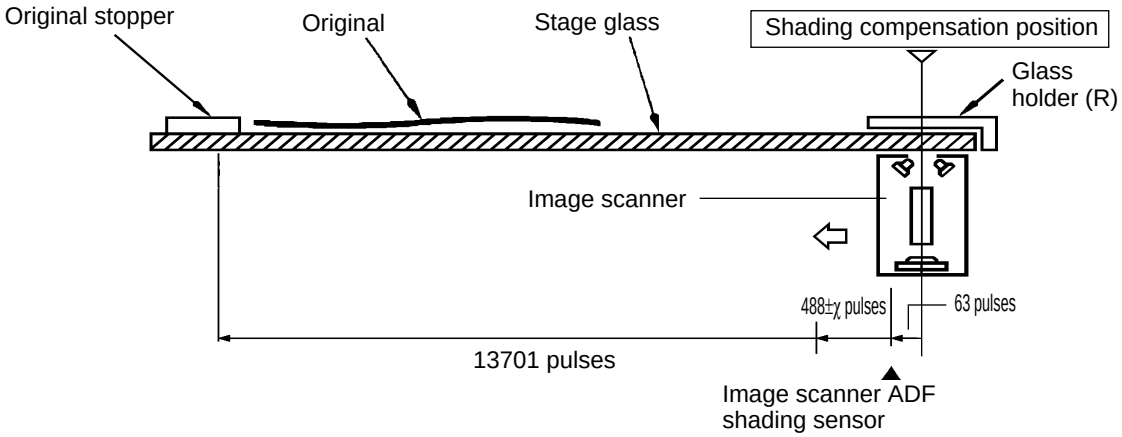
200ms later, the Flat bed read pulse motor is activated to move the Image scanner to the left.

488 pulses after the Image scanner goes off the Image scanner ADF shading sensor, the Image scanner starts to scan the original to find its size before scanning images.

- End of pre-Scanning

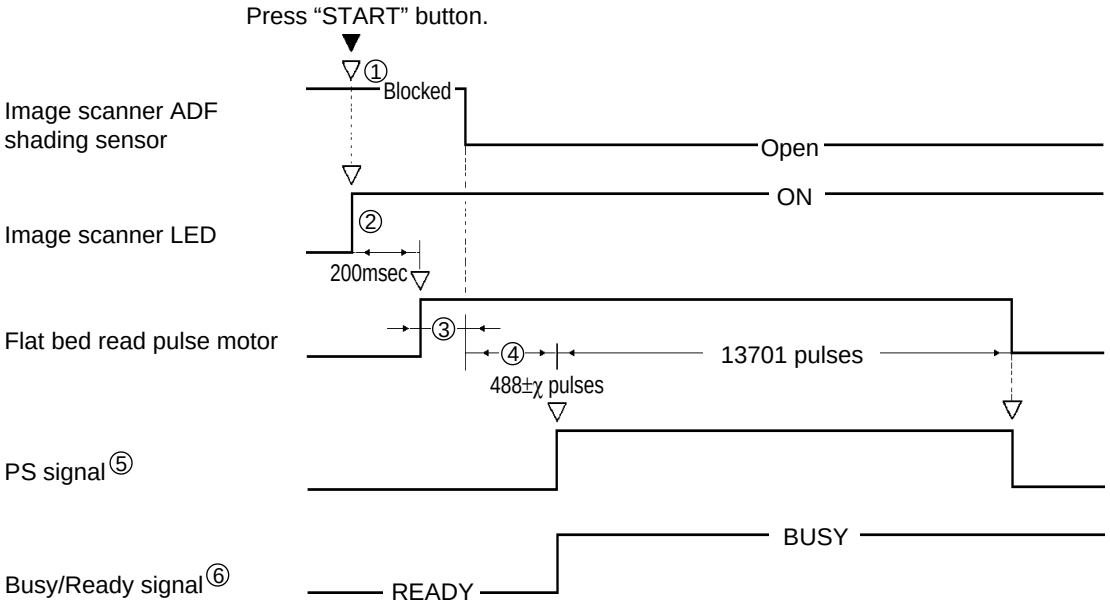
13701 pulses later, the Flat bed read pulse motor is deactivated to finish the pre-scanning operation and the image scanning process is started.





- Timing Chart -

Pre-Scanning System - With Book Processing Feature & Without ADF



① If the Image scanner ADF shading sensor is not detecting the bracket of the Image scanner, the Image scanner is moved to the ADF home position to set the Image scanner ready for the prescanning process.
② The Shading compensation is made automatically when the LEDs of the Image scanner are turned ON.
③ If the Image scanner has not gone off the Image scanner ADF shading sensor **within 314 pulses** after the Flat bed read pulse motor is activated, it is assumed that the Flat bed read pulse motor has been locked and the error code **[E 15]** is displayed on the operation panel.
④ The"χ" pulse can be increased or decreased by Memory switch **No.82**.
⑤ The PS signal is the command to confirm the size of the original, which is output from the Image processing PCB to the Trimming PCB.
⑥ "Busy" signal is output from the Trimming PCB to the Image processing PCB while the Trimming PCB is calculating and confirming the original size.

6. Image Scanning System - With Book Processing Feature & Without ADF

- Basic

After the pre-scanning is finished, the Image scanner starts to scan images when the Image scanner reaches the Image scanner home position sensor.

The Shading compensation is already made at the beginning of the pre-scanning process.

- Start of Image Scanning

When the pre-scanning is finished and the original size is calculated, the Flat bed read pulse motor is activated to move the Image scanner to the right.

When the Flat bed read pulse motor rotates by a given number of pulses, given as a result of the original size calculation, the Read & Write start signal is turned ON, leading the Image scanner to start scanning images.

At the same time, the Master making and Master removal processes take place.

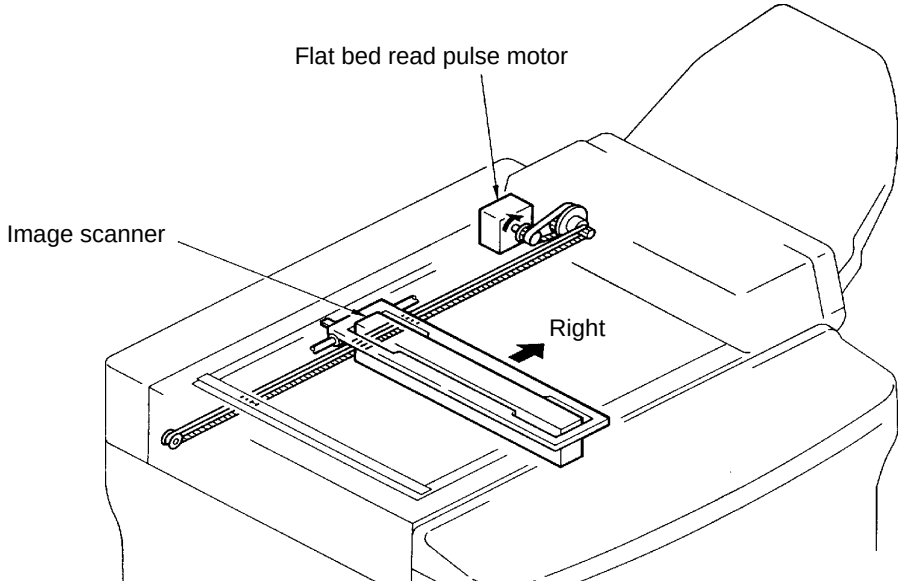
- End of Image Scanning

When images are scanned for the calculated size of the original or if a master is made for the size of the paper on the Paper feed tray, the Read & Write start signal and the Flat bed read pulse motor are turned OFF to end the image scanning process.

When the Read & Write start signal is turned OFF, the master making process is also finished and a new-made master starts to be loaded on the Drum after confirming that a used master has been removed completely.

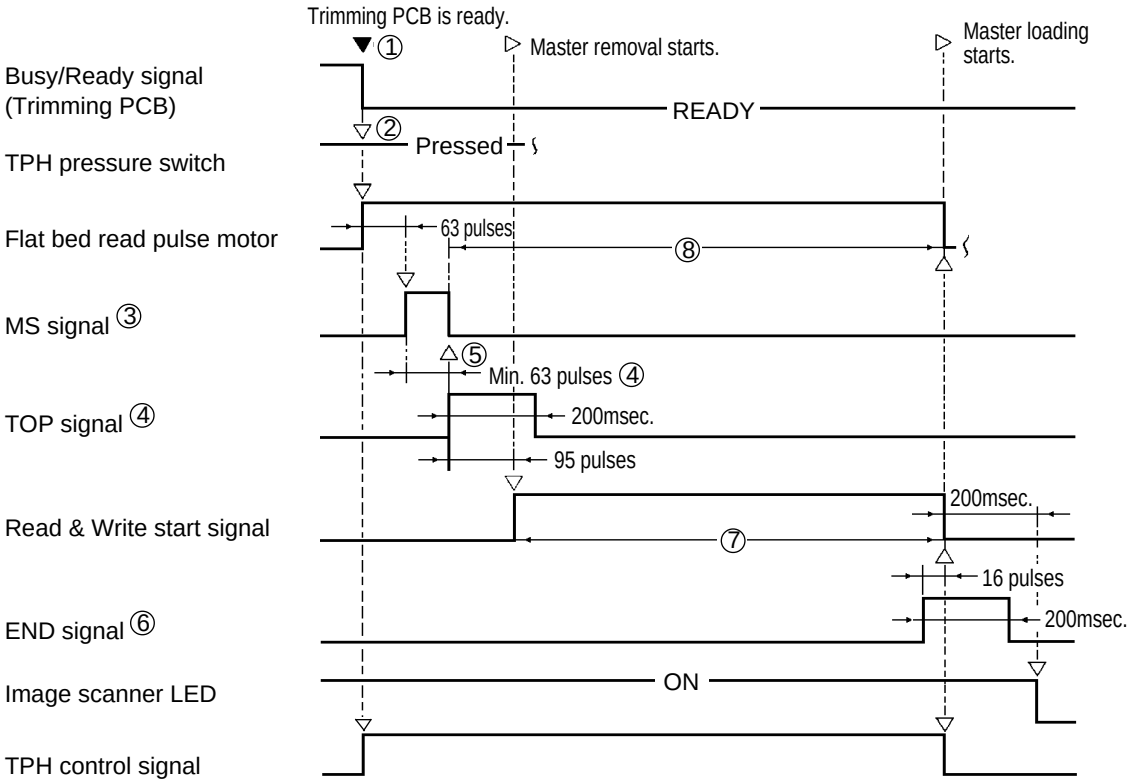
- Return to Home of Image Scanner

200msec after the Read & Write start signal is turned OFF, the LEDs of the Image scanner are turned OFF and the Flat bed read pulse motor restarts rotating to return the Image scanner to the home position for the Book processing feature (at the Image scanner ADF shading sensor).



- Timing Chart -

Image Scanning System - With Book Processing Feature & Without ADF



① The image scanning starts when the Busy/Ready signal of the Trimming PCB becomes "Ready".
② The image scanning starts only after the TPH pressure switch is pressed ON.
If the TPH pressure switch is not pressed ON, the Thermal pressure motor is rotated until the switch is pressed.
③ The MS signal starts image scanning and is output from the Image processing PCB to the Trimming PCB.
④ The TOP signal identifies the top position of the original confirmed during the pre-scanning process, output from the Trimming PCB to the Image processing PCB.
The TOP signal is output from the Trimming PCB **63 ~ 158 pulses** after the MS signal is received by the Trimming PCB.
The start position of image writing (master making) is automatically compensated even though an original is misplaced away from the Original stopper on the Stage glass, if the lead edge remains **within 3mm** from the Original stopper.
⑤ If the TOP signal has not been output **within 315 pulses** after the the MS signal is output, it is assumed that the Trimming PCB is faulty and the error code **[E 10]** is displayed on the panel.
⑥ The END signal indicates that the tailing edge of the original was confirmed during the pre-scanning process. It is output from the Trimming PCB to the Image processing PCB.
⑦ If the Write pulse motor rotated for the size of the paper on the Paper feed tray, the Read & Write start signal and the LEDs of the Image scanner are turned OFF even before the END signal is output.
⑧ After the MS signal is output, if the END signal has not been output **within 13701 pulses** after the Flat bed read pulse motor is activated, the Read & Write start signal and the LEDs of the Image scanner are turned OFF and a newly-made master starts to be loaded on the Drum.

7. ADF Original Loading System

- Basic

An original is loaded into the ADF unit via the FB-ADF motor and waits until the "START" button is pressed to start the image scanning operation.

- Start of Original Loading

When originals are set in the ADF unit, they push the actuator out of the FB-ADF original detection sensor.

2 seconds later, the FB-ADF pickup solenoid is energized and lifts the FB-ADF pickup pad, raising the originals against the FB-ADF pickup roller (upper) via Pickup solenoid arm.

200ms later, the FB-ADF motor is energized to turn the FB-ADF pickup roller (upper) and ADF stripper roller (via ADF gear and belt).

- Pickup of One Original

As the FB-ADF stripper is pressed against the ADF stripper roller by the Stripper arm spring, one original is separated and fed into the ADF unit by rotation of the ADF stripper roller.

The original pushes the actuator out of the Original registration sensor, and **200ms** later, the FB-ADF pickup solenoid and FB-ADF motor are turned OFF.

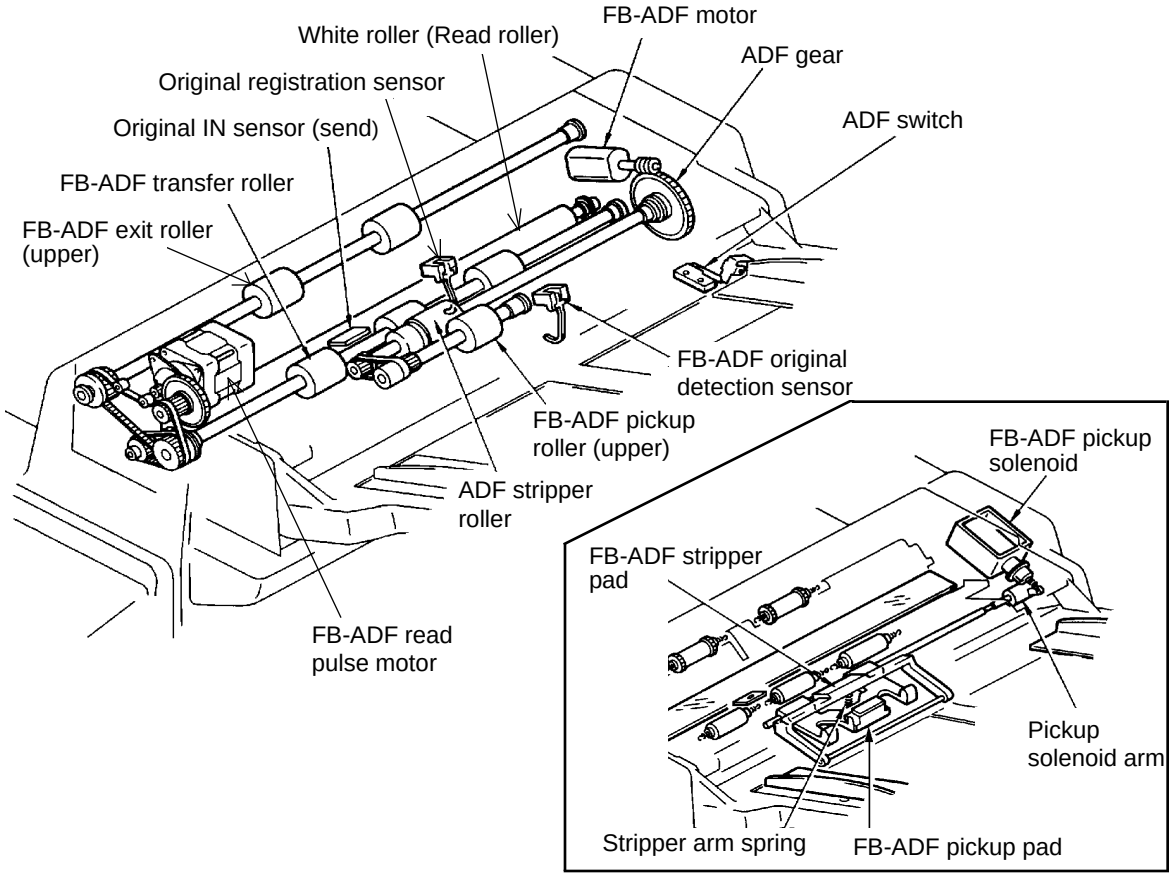
10ms later, the FB-ADF read pulse motor is activated to turn the FB-ADF transfer roller, White roller (Read roller) and FB-ADF exit roller (upper) via pulleys and belts.

- Finish of Original Loading

The FB-ADF read pulse motor is turned OFF **778 pulses** after the leading edge of the original blocks the light path of the Original IN sensor.

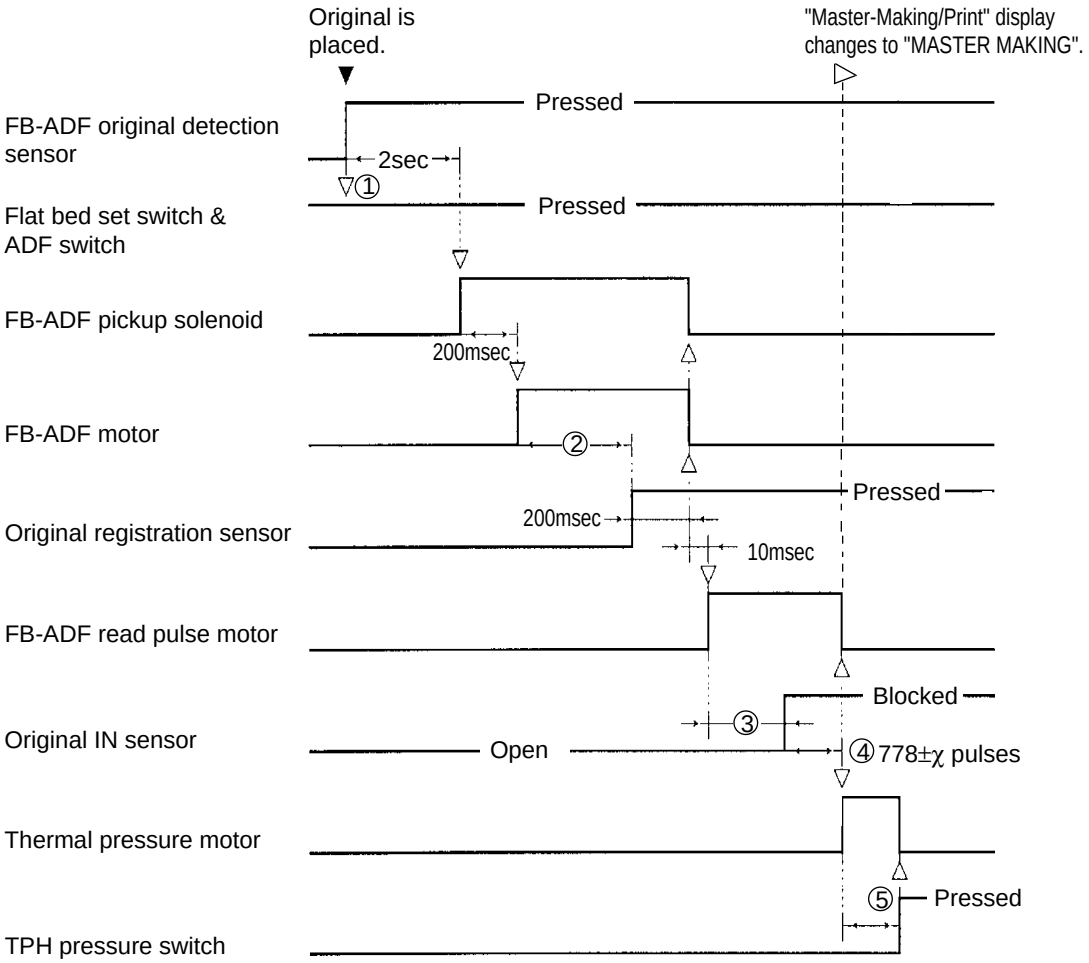
- Change of Panel Display & Preparation for Master Making

The "Master-Making/Print" display on the operation panel is changed from "PRINT" to "MASTER MAKING". At the same time, the Thermal pressure motor is activated to lower the Thermal print head until the TPH pressure switch is pressed.



- Timing Chart -

ADF Original Loading System



① The Flat bed set switch and ADF switch should be actuated ON to activate the FB-ADF original detection sensor.
② If the Original registration sensor has not detected an original **within 1.35 seconds** after the FB-ADF motor is activated, the machine assumes the original has misfed and indicates the error code **[E 36]**.
③ If the Original IN sensor has not detected an original **within 630 pulses** after the FB-ADF read pulse motor is activated, the machine assumes the original has jammed at the ADF entrance and indicates the error code **[E 37]**.
④ The adjustment of "χ" pulses is possible by using the Memory switch **No.86**.
⑤ If the TPH pressure switch has not been actuated ON **within 4 seconds** after the Thermal pressure motor is activated, the machine assumes that the Thermal pressure motor has been locked and indicates the error code **[E 19]**.
* After the original loading is finished, the image scanning starts when the "START" button is pressed.

8. ADF Image Scanning System

- Shading Compensation

When the "START" button is pressed, after the original has been set in position, the LEDs of the Image Scanner are turned ON and the shading compensation is made.

200ms later, the Flat bed read pulse motor is activated, leading the Image scanner to the position for image scanning under the ADF unit.

- Start of Scanning

After the Image scanner slides out of the Image scanner ADF shading sensor, the Flat bed read pulse motor rotates **1811 pulses** more and then stops with the Image scanner positioned for image scanning.

At the same time, the FB-ADF read pulse motor is activated to feed the original by rotating the FB-ADF transfer roller and FB-ADF exit roller via pulleys and belt and the Read & Write start signal is turned ON to start the scanning of the original.

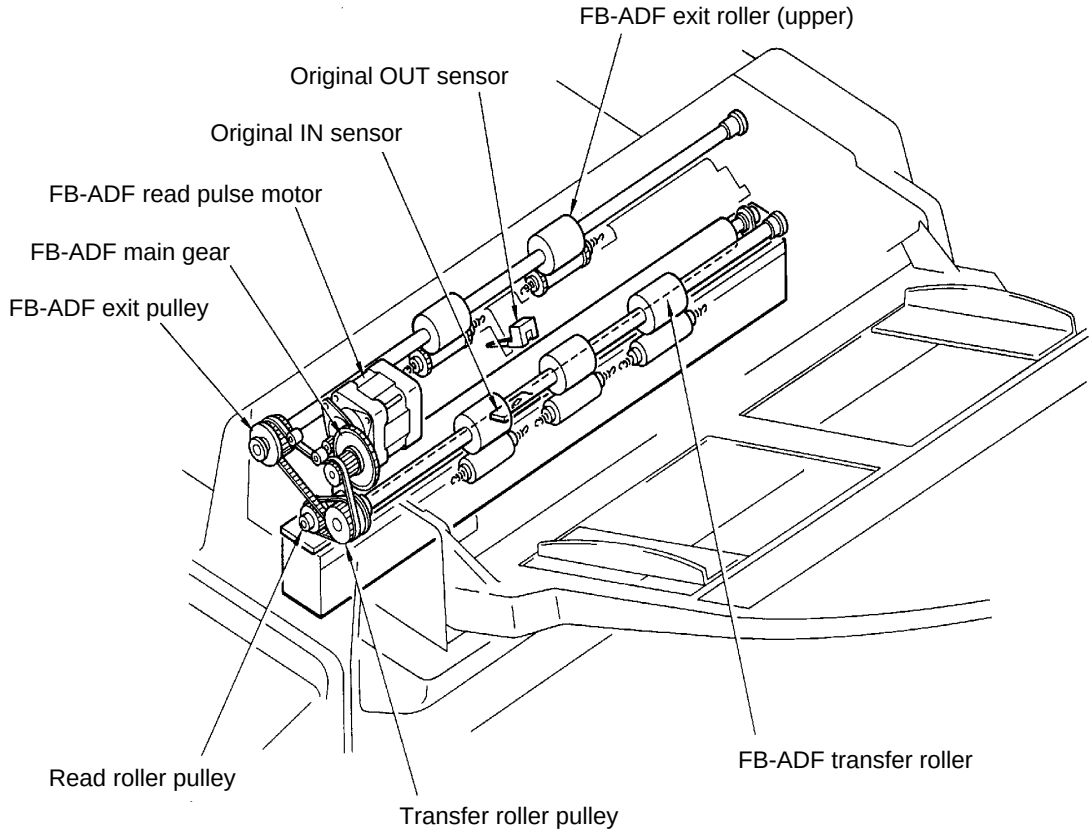
- Finish of Scanning

The original proceeding through the ADF unit opens the light path of the Original OUT sensor by pushing the actuator out of the sensor.

When the original advances further and its trailing edge passes through the Original IN sensor and opens its light path, **278 pulses** later, the Read & Write start signal is turned OFF to end the scanning of the original.

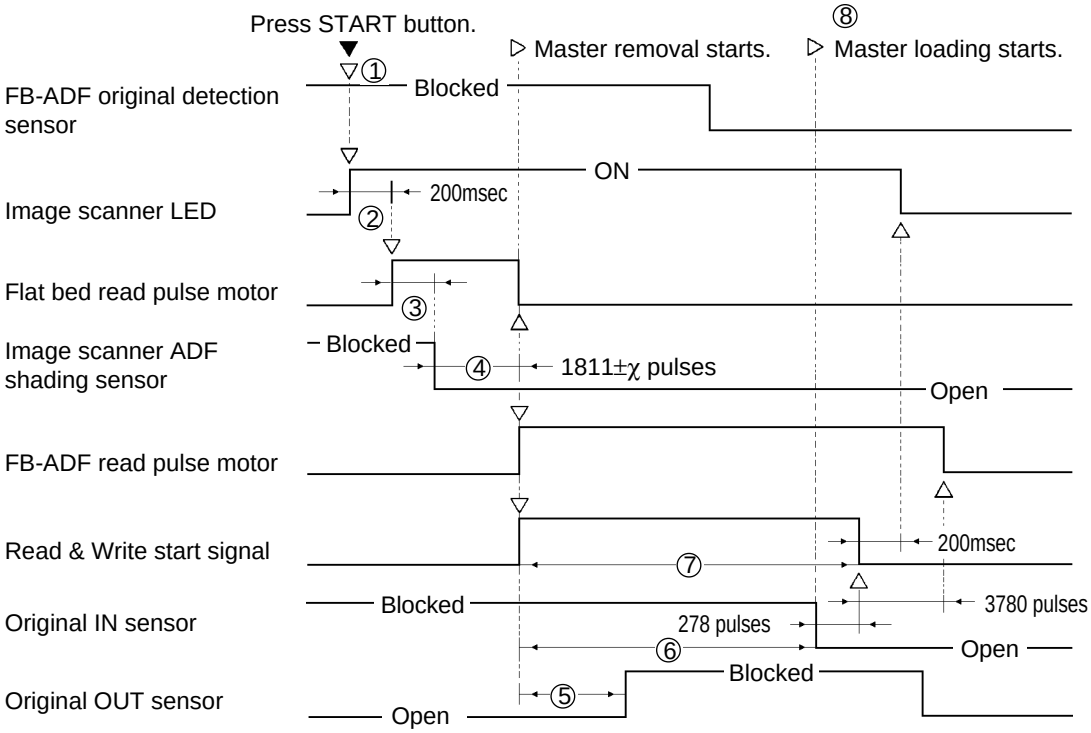
- Ejection of the Original

The FB-ADF read pulse motor is rotated further for **3780 pulses** after the Read and Write start signal is turned OFF to finish the transportation of the original out of the ADF unit.



- Timing Chart -

ADF Image Scanning System



① The "START" button cannot be activated until an original is completely loaded in the ADF.
② The shading compensation starts when the LED arrays of the Image scanner are turned ON.
③ If the Image scanner has not slided out of the Image scanner ADF shading sensor **within 314 pulses** after the Flat bed read pulse motor is activated, it is assumed that Flat bed read pulse motor has been locked and the error code **[E 15]** is displayed on the operation panel.
④ The adjustment of "χ" pulses is possible by using the Memory switch **No.81**.
⑤ If the Original OUT sensor has not detected an original **within 1890 pulses** after the FB-ADF read pulse motor is activated, it is assumed that the original has jammed at the exit of ADF and the error code **[E 39]** is displayed on the operation panel**.**
⑥ If the Original IN sensor keeps detecting an original **for 14803 pulses** after the FB-ADF read pulse motor was activated, the machine assumes the original has jammed or is oversized and indicates the error code **[E 38]** on the operation panel.
⑦ The Read & Write start signal is turned OFF **278 pulses** after the trailing edge of the original clears out of the Original IN sensor, or when the Write pulse motor has rotated for the size of paper on the Paper feed tray.
⑧ When the trailing edge of the original clears out of the Original IN sensor, a newly-made master starts to be loaded on the Drum after confirming that a used master is completely removed from the Drum.
If the Read & Write start signal is turned OFF before the original clears out of the Original IN sensor, the newly-made master starts to be loaded on the Drum at that time.

9. Image Scanning System - in Auto Scanning Contrast Adjustment Mode <GR>

* Timing chart is on page VI-19.

- Basic

The Image scanner is located at the Image scanner home position. Reading of the original background density starts after the shading compensation is made.

- Reading (Detection) of Original Background Density [AUTO BASE CONTROL]

By placing an original on the Stage glass and pressing the START button, the LEDs of the Image scanner are turned ON and the shading compensation is started.
200msec. later, the Flat bed read pluse motor is activated to move the Image scanner to the right.
598 pulses (19mm) After the Image scanner moves out of the Image scanner home position, the Image scanner reads the original background density.Reading of the original background density is repeated twice; **81 pulses (2.57mm)** after the initial reading spot and **81 pulses (2.57mm)** after the second reading spot.

- Return Home of Image Scanner

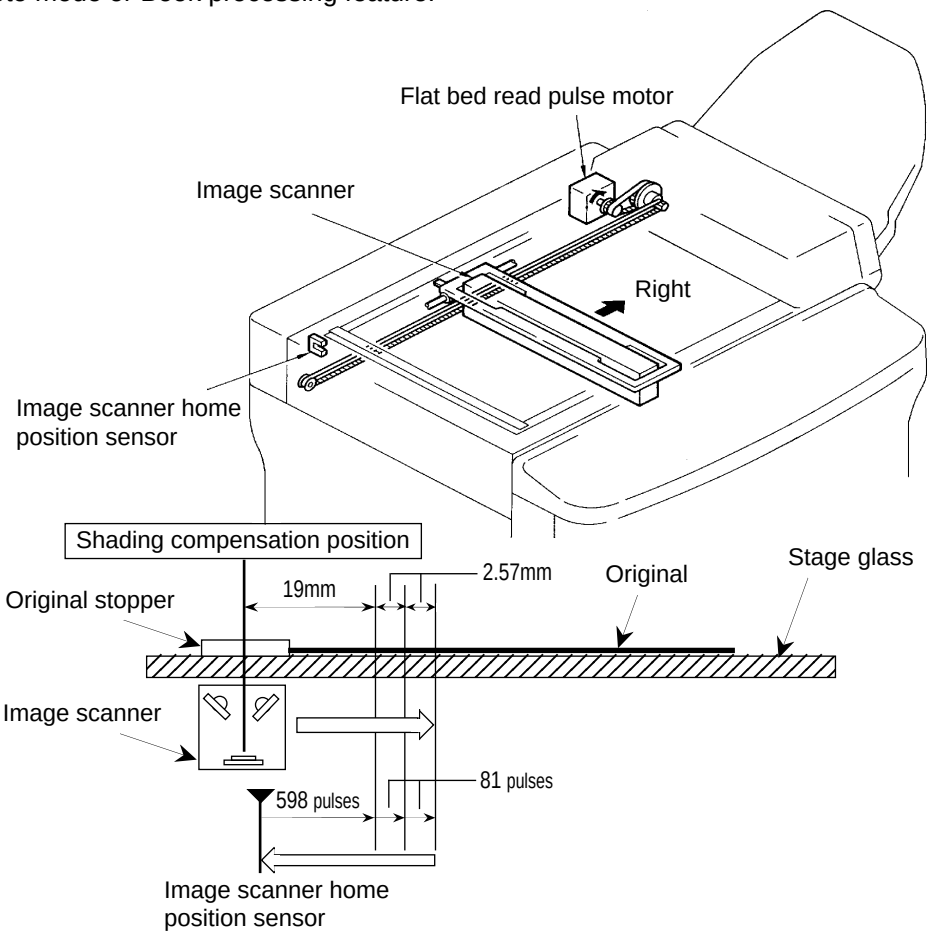
10msec. After the third reading of the original background density is finished, the Flat bed read pulse motor starts to reverse rotation to return the Image scanner to the home position (at the Image scanner home position sensor).

- Start of Image Scanning

When the Image scanner returns to the home position, the Flat bed read pulse motor reverses rotation, leading the Image scanner to start moving to the right.
Subsequently, the image is scanned the same way as when scanning images without the Book processing feature, as described on page VI-6.

- Availability of Auto Scanning Contrast Adjustment Mode

The Auto Contrast Mode is not available when any of the following features selected; Photo mode, Dot photo mode or Book processing feature.



10. ADF Image Scanning System - in Auto Scanning Contrast Adjustment Mode <GR>

- Shading Compensation

When the "START" button is pressed, the LEDs of the Image Scanner are turned ON and the shading compensation begins.

200ms later, the Flat bed read pulse motor is activated, leading the Image scanner under the ADF unit.

- Reading (Detection) of Original Background Density [AUTO BASE CONTROL]

After the Image scanner slides out of the shading sensor, the Flat bed read pulse motor rotates **1811 pulses** and then stops in position for image scanning.

At the same time, the Auto base control data is cleared from the memory on the Image processing PCB. The Image scanner starts reading the original background density for the new Auto base control data.

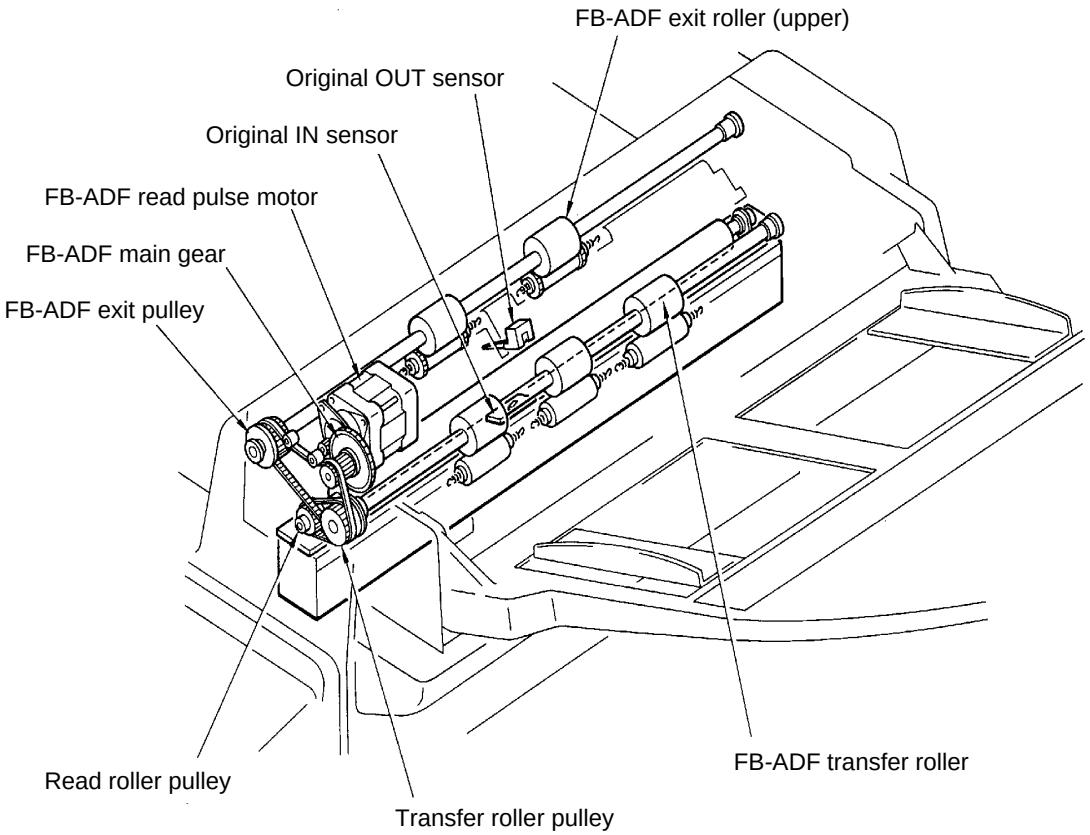
- Start of Image Scanning

After the original background density data has been read and processed into the new Auto base control data, the FB-ADF read pulse motor is activated to feed the original. The Read & Write start signal are turned ON to start image scanning.

Subsequently, the image is scanned the same way as described on page VI-14.

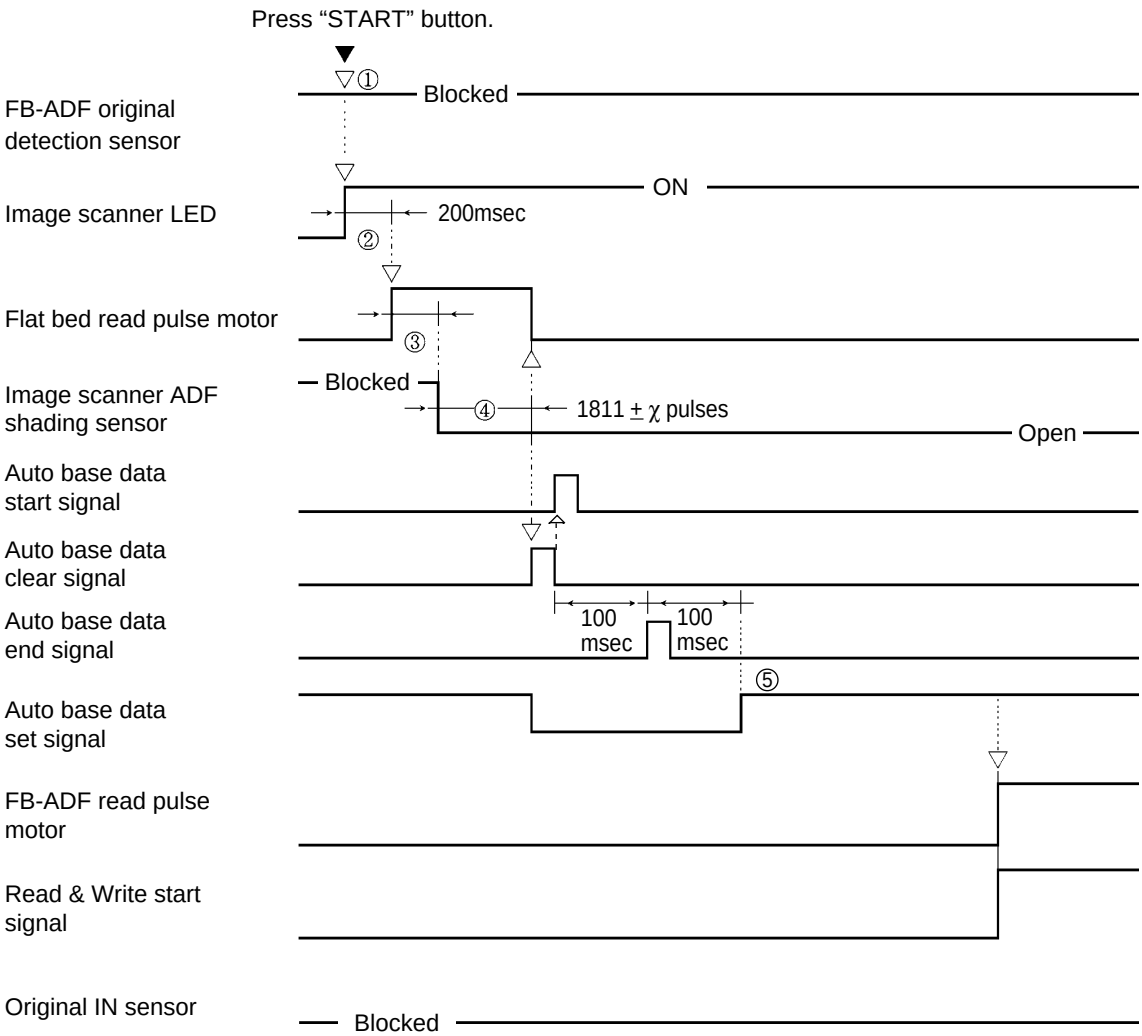
- Availability of Auto Scanning Contrast Adjustment Mode

The Auto scanning contrast adjustment mode is not available with the Photo mode or Dot photo mode.



- Timing Chart -

ADF Image Scanning System - in Auto Scanning Contrast Adjustment Mode <GR>



① The "START" key cannot be activated until an original is set in the ADF.

② The shading compensation is performed automatically when the LEDs of the Image scanner are turned ON.

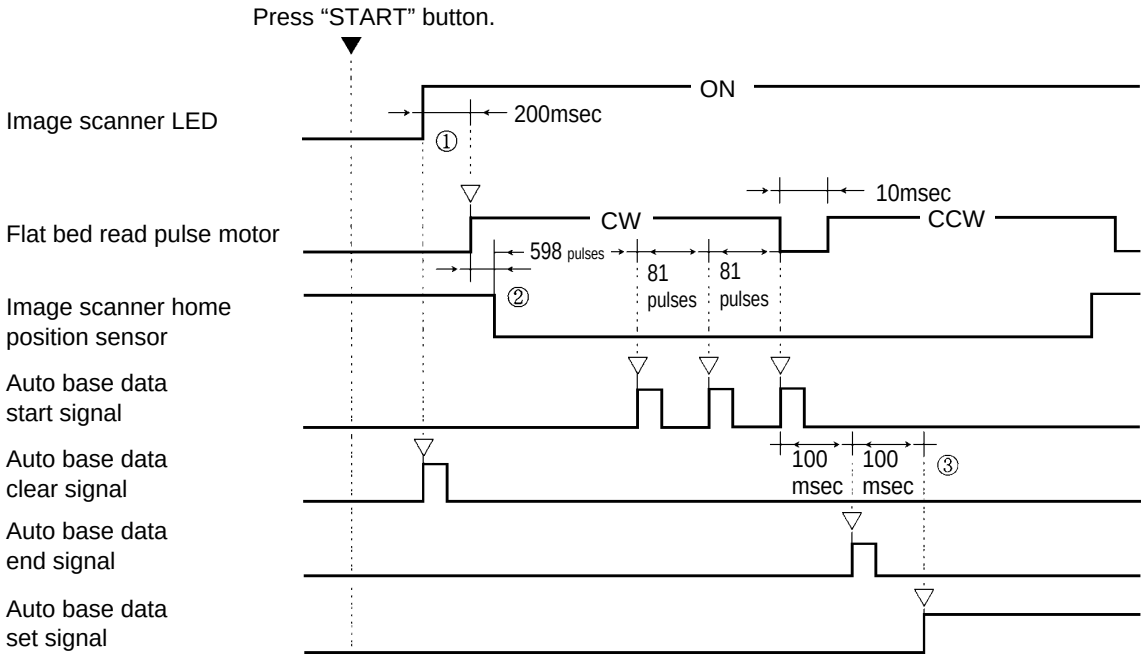
③ If the Image scanner has not gone out of the Image scanner home position **within 314 pulses** after the Flat bed read pulse motor is activated, i.e., it is assumed that the Flat bed read pulse motor has been locked and the error message **"T15 CALL SERVICE"** or **[E 15]** is displayed on the operation panel.

④ The adjustment of "χ" pulses is possible by using the Memory switch **No.81**.

⑤ If the Auto base data set signal has not been sent 100 msec after the Auto base data end signal is output, the operation is interrupted after the Image scanner returns to the home position. The error message **"T10 TURN MAIN POWER SW. OFF THEN ON"** OR **[E 15]** is displayed on the operation panel. If restarting does not clear error, refer to the Advice Disply section in APX (IV)

- Timing Chart -

Image Scanning System - in Auto Scanning Contrast Adjustment Mode <GR>



① The shading compensation is automatic when the LEDs of the Image scanner are turned ON.

② If the Image scanner in not out of the Image scanner home position sensor **within 314 pulses** after the Flat bed read pulse motor is activated, i.e. the light path of the sensor has not been opened, it is assumed that the Flat bed read pulse motor has been locked and the error message **"T15 CALL SERVICE"** or **[E 15]** is displayed on the operation panel.

③ If the Auto base data set signal is not turned ON 100 msec after the Auto base data end signal is output, the operation is interrupted after the Image scanner returns to the home position and the error message **"T10 TURN MAIN POWER SW. OFF THEN ON"** OR **[E 15]** is displayed on the operation panel. If restarting does not clear error, refer to the Advice Disply section in APX (IV)